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Highlights of Phase II: Scrapie: Ovine Slaughter Surveillance Study 2002-2003

The purpose of the SOSS study was to estimate the regional and national prevalence of scrapie in mature cull sheep in the United States.

Phase I of SOSS was conducted from February 2001 through March 2002 and included refinement of the study design and sample collection training. The purpose of Phase I was to develop and modify the sample collection and testing processes, without emphasizing statistical results.

SOSS Phase II is similar to Phase I in that sample collection procedures and testing were used, along with a representative sample allocation. Beginning April 1, 2002, and continuing through March 31, 2003, Phase II included the collection of tissue samples from 12,508 sheep from 22 slaughter plants throughout the United States (21 FSIS inspected, 1 State plant) and 1 large livestock market in Texas. The 21 FSIS plants represented approximately two-thirds of the total FSIS mature sheep slaughtered during the study period. The livestock market represented approximately one-half of the live sheep exported to Mexico. All sample data were statistically weighted to reflect the population from which the sample was selected. The number of samples collected from each plant on a specific day was statistically weighted to represent the volume of mature sheep slaughtered (sold) through each plant (market) that specific day. This weight was adjusted for the total volume of mature sheep through the plant (market) from April 2002 through March 2003. Within each facility sample collectors were instructed to collect samples using systematic sampling. Overall, the samples collected from the 22 plants and the livestock market represented 299,000 sheep (54 percent of the cull sheep population, estimated at 550,000 head).

Sheep were traced to State of origin based on ear tags and/or other information obtained by the collector at the plant or market. For analysis

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purposes, samples identified to individual States were assigned to one of four defined regions. Sometimes only a listing of multiple States could be obtained for a group of sheep (e.g., market animals accumulated across numerous States). These samples were assigned to the Multiregion category if the States they came from were not all in the same region. In cases where a trace State was not identified by the collector ($n = 2,020$), a region was assigned based on their official identification information. The 2001 NAHMS Sheep study showed that at least 95 percent of cull sheep movement was within the region of origin. Out of the 12,508 samples submitted, all but 2,127 were identified to a unique region (Table 1).

Table 1. Number of Samples Submitted, by Face Color and By Region.

	Samples Submitted Region					
Face Color	West	Mountain	Central	East	Multi- region	Total
Black	100	535	680	1,023	453	2,791
White	493	2,997	1,993	1,283	1,472	8,238
Mottled	71	305	413	404	194	1,387
Unknown	6	32	4	42	8	92
Total	670	3,869	3,090	2,752	2,127	12,508

Obex, tonsil, and lymph-node tissues from each sheep were tested using the immunohistochemistry (IHC) technique at the National Veterinary Services Laboratory. A positive case was defined as having a positive test result on any tissue.

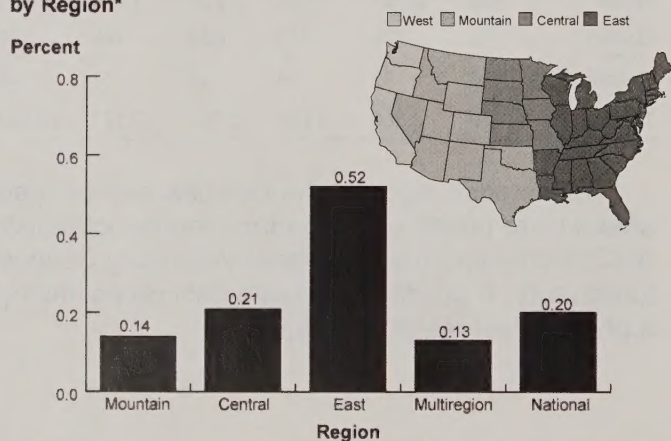
Prior to the SOSS study, the estimated prevalence of scrapie in the United States was 0.07 percent (based on unpublished data from the NAHMS Sheep '96 study). However, the Sheep '96 estimate was based on a mail-in survey of producers who reported the presence of suspected or confirmed cases of scrapie in their flock over a period of 5 years, including lambs and mature sheep. The flock estimate was then expanded based on flock size to generate the animal-level prevalence estimate. The results of the SOSS study cannot be directly compared to the Sheep '96 prevalence estimate because of differences in study design, reference population, and data collection methods.

The following highlights were excerpted from Phase II: Scrapie: Ovine Slaughter Surveillance Study 2002-2003.

Prevalence estimates

- Of the 12,508 mature sheep sampled, valid (at least one testable tissue) test results were obtained from 12,491 (99.9 percent). A positive result was recorded for any animal that tested positive by IHC on **one or more of the tissues sampled**. The overall weighted national prevalence of scrapie in mature sheep is 0.20 percent. Estimates could not be made in the West region due to the low number of samples obtained. However, national estimates include samples collected in the West region (Figure 1).

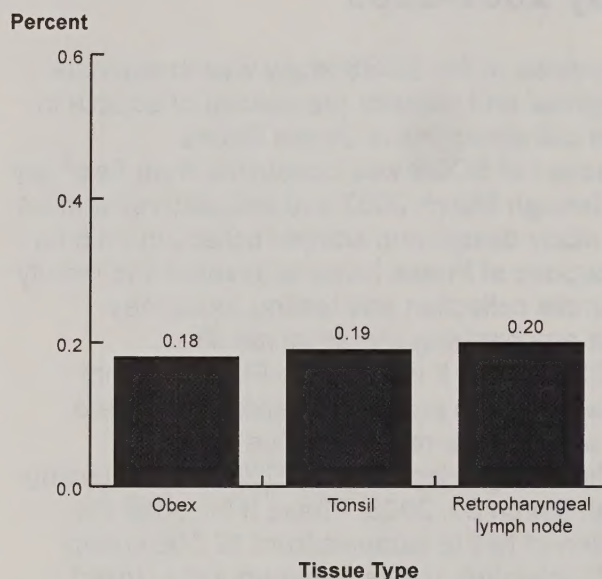
Figure 1. Percent of Sheep that Tested Positive for Scrapie, by Region*



*Because of the low number of samples obtained in the West region, results for the West region are included in the National estimates but are not listed individually.

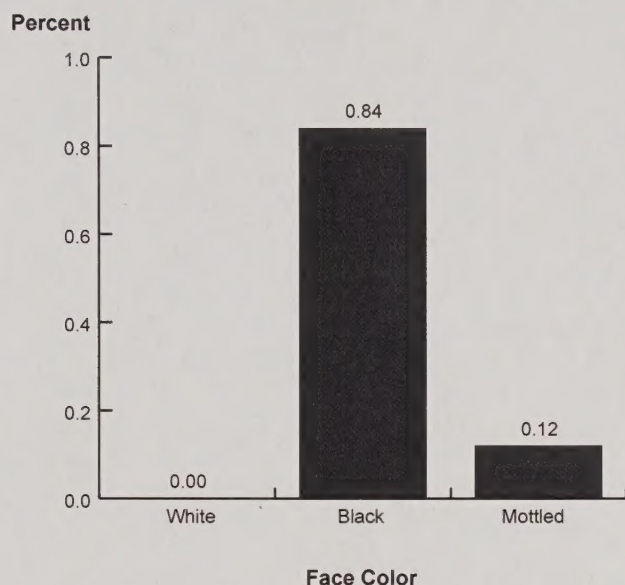
- Three tissue types (obex, tonsil, and retropharyngeal lymph node) were collected from each sheep head for IHC testing. As expected, each tissue type differed slightly in the number tested as well as the number of positive results; however, the prevalence was similar for the three tissue types (Figure 2).

Figure 2. Percent of Sheep That Tested Positive for Scrapie, by Tissue Type



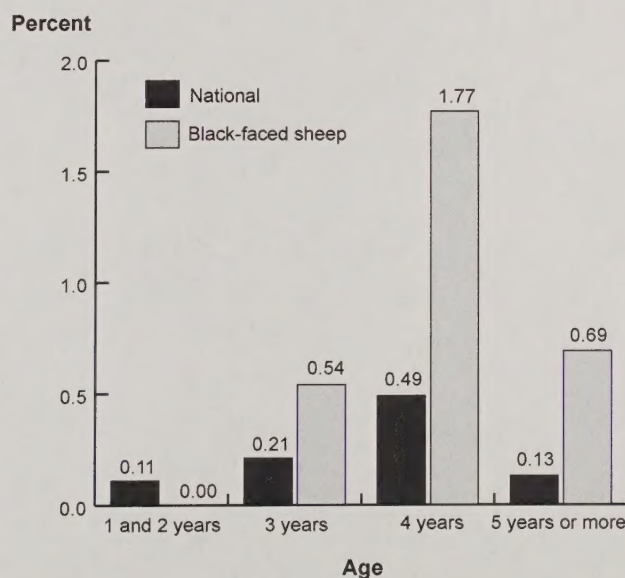
- Scrapie prevalence (one or more tissue samples tested positive) was highest in black-faced sheep (0.84 percent). White-faced sheep were far less likely to test positive for scrapie (less than 0.01 percent). Some animals were presented for sample collection with the skin removed. Therefore, face color could not be determined on these animals and they were not included in these estimates (Figure 3).

Figure 3. Percent of Sheep That Tested Positive for Scrapie, by Face Color



- Age was determined based on the number of visible permanent incisors. Four-year-old sheep tested positive (one or more tissue samples tested positive) most frequently (0.49 percent of sheep tested). Scrapie prevalence increased with age until the animals reached 4 years old, then decreased (Figure 4).

Figure 4. Percent of Sheep That Tested Positive for Scrapie (National and Black-faced Sheep), by Age



Genetics

Tissue samples from the 33 sheep that tested positive for scrapie were submitted for genetic testing. All 33 samples were of the QQ genotype at codon 171. This genotype has been characterized as the least resistant to scrapie.

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